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(54)【発明の名称】 養魚飼料添加剤および養魚飼料

(57)【要約】

【目的】 従来の養殖魚類の肉質が天然魚の筋肉に比べて劣るという問題点を解決し、養殖魚類の肉質及び体色を大幅に改善することができる養魚飼料添加剤および養魚飼料を提供する。

【構成】 リン脂質100gに対してカロチノイド0.1g~10gの割合で配合してなる養魚飼料添加剤、および、飼料100g中にリン脂質2g以上とカロチノイド3mg以上とを含有してなる養魚飼料。

## 【特許請求の範囲】

【請求項1】 リン脂質100gに対してカロチノイド0.1g〜10gの割合で配合してなる養魚飼料添加剤。

【請求項2】 リン脂質が大豆、菜種、鶏卵、魚卵由来のものである請求項1の添加剤。

【請求項3】 カロチノイドが、アスタキサンチン、カンタキサンチン、ゼアキサンチン、ツナキサンチン、ルテイン、β-カロチンから選ばれたものである請求項1の添加剤。

【請求項4】 飼料100g中にリン脂質2g以上とカロチノイド3mg以上とを含有してなる養魚飼料。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は養魚飼料添加剤に関する。本発明は添加剤を配合した飼料を与えることにより、養殖魚類の肉質を改善することができる。

【0002】

【従来の技術】養殖魚類の可食部である筋肉の品質が天然魚の筋肉に比べて劣ることはたびたび指摘されるところである。その肉質の違いは、ブリ、マダイ、ヒラメ等の血合筋の赤い色の鮮やかな色合いが養殖魚では劣ること、次に、味、臭いの点で異味、異臭が伴うことが多い点である。また、白色筋が透明感のある白色であるべきところが、毛細血管のメラニン色素沈着により、黒い糸状の模様が生じ、筋肉が暗色になるなどして、商品価値を失なうという問題がある。

【0003】リン脂質は重要な生体構成成分であり、養魚飼料、例えば、通常のもいストベレットや配合飼料中に、0.1%程度またはそれ以下の量が含まれている。また、飼料中に、油の分散、乳化等の目的や、カロリー源として添加され（特開平3-7546、特開昭48-77号公報）、さらに稚仔魚期に必要な栄養素としても用いられている（特公昭61-43977、63-35223号公報）。

【0004】一方、カロチノイド色素は、養魚飼料には、0.3mg程度含まれているが、錦ゴイやマダイの体表面、もしくは、サケ、マス類の筋肉色を付けるため、カロチノイド、または、カロチノイドを含む、エビ、カニ、海藻、スピルリナ、マリーゴールド、アルファルファや酵母等の天然素材を飼料に配合して投与する。（「水産動物のカロチノイド」恒星社厚生閣 昭和63年発行、特公昭63-61907号公報等）しかしながら、これらの方法は、上記した養殖魚類の肉質を向上する目的で用いられるものではなく、その改善効果は未だ十分とはいえない。

【0005】

【発明が解決しようとする課題】本発明は、これらの従来の養殖魚類の肉質が天然魚の筋肉に比べて劣るという問題点を解決し、養殖魚類の肉質及び体色を大幅に改善

することができる養魚飼料添加剤を提供しようとするものである。

【0006】

【課題を解決するための手段】本発明者らは、鋭意研究を重ねた結果、リン脂質にカロチノイドを混合してなる添加剤を配合した飼料を魚類に投与することによって、上記した養殖魚の欠点を大幅に改善する効果のあることを見出し、本発明を完成するに至った。すなわち、本発明は、リン脂質100gに対してカロチノイド0.1g〜10gを配合してなる、養殖魚の肉質を改善する養魚飼料添加剤、および、養魚飼料100g中にリン脂質2g以上とカロチノイド3mg以上とを含有してなる養魚飼料を提供するものである。

【0007】リン脂質は動、植物の細胞や種子に含まれる生体構成成分であり、ホスファチジルコリンやホスファチジルエタノールアミン、ホスファチジルセリン等から構成されている。本発明に用いられるリン脂質としては、大豆、菜種の搾油工程から生産されるレシチンや、鶏卵の卵黄より得られるレシチン、魚卵由来のレシチンが挙げられる。一般に、大豆レシチンが主に用いられる。搾油工程で得られるレシチンは、通常、レシチン60%大豆油40%程度の粘性のある液体として得られ、有機溶剤で脱油精製された高純度レシチンはクリーム色の粉末である。

【0008】本発明においては、粉末状のものをそのまま用いることが出来るが、植物油脂または動物油脂で希釈されたものを用いることもできる。希釈に用いられる植物油脂としては、大豆油、コーン油、菜種油、オリーブ油、ペニ花油、綿実油等が、また、動物油脂としては、ラード、ヘット、魚油等が挙げられる。飼料中に添加する目的から、油脂による希釈の割合は、通常、10倍以下である。

【0009】カロチノイドは、魚類の肉色を発現するカロチノイド色素として、又はプロビタミンとして生体を構成する成分である。本発明に用いられるカロチノイドとしては、アスタキサンチン、カンタキサンチン、ゼアキサンチン、ツナキサンチン、ルテイン、β-カロチンが挙げられる。これらのカロチノイドは、化学合成により得られるものと天然素材から抽出されるものがあり、その何れを用いてもよい。市販品としては、アスタキサンチン製剤、β-カロチン結晶等の他、天然オキアミ油としてアスタキサンチン80%を含むカロチノイド複合体等を利用することができる。

【0010】また、アスタキサンチン、カンタキサンチン、ルテイン等のカロチノイドを数mg%程度含むエビ（イサザアミ、オキアミ等）、カニ類、カロチノイドを数10mg%程度含む海藻、スピルリナ、マリーゴールド、アルファルファ等や、カロチノイドを50〜100mg%程度含む赤色酵母等の天然素材を、ミンチ状もしくは細断または粉碎して、用いることもできる。リン

脂質とカロチノイドの配合割合は、養殖魚類によって、その種類と量を決定するものであるが、通常、リン脂質100gに対してカロチノイド0.1g~10g、好ましくは、0.1g~1.0gの範囲である。

【0011】本発明の養魚飼料添加剤は、養殖魚類に投与する飼料に配合して用いられる。養殖魚類に投与する飼料は、主に、イワシ、サバ、アジ、サンマ、イカナゴ等の多獲魚が用いられ、そのままか冷凍した後にミンチ状にして、CMCやグアーガム等の粘結剤を併用して配合する場合と、これらの多獲魚を魚粉に加工したものに配合して投与される場合がある。

【0012】飼料中に添加する量は、0.1g/100g飼料~10g/100g飼料であるが、好ましくはリン脂質量2g~10g/100g飼料、カロチノイド量3mg~100mg/100g飼料になるよう添加する。飼料に添加して投与する期間は濃度、魚種によって異なるが、増肉に伴って効果が発現するため、2週間以上を要す。

【0013】

【作用】カロチノイドの単独使用ではその色素の移行によって蓄積された色が現われる程度であるが、リン脂質との併用により、その効果が高まるだけでなく、カロチノイドではない血合筋中のミオグロビン色素の安定化を促進して、鮮やかな色合いを発するとともに、持続することが判明した。また、味、臭いの点においても改善が見られ、毛細血管のメラニン色素沈着をも防止する。

【0014】

【発明の効果】

(1) 血合筋の鮮やかな赤色の保持効果

魚類の筋肉には、白色筋と血合筋がある。この赤い血合筋の色素は、カロチノイドとは違い、ミオグロビン色素による色であるが、養殖魚類の血合筋は変色が非常に速やかである。本発明の添加剤を含む飼料の投与を続けた養殖魚類の筋肉には鮮やかな赤色の血合筋が生じ、フィレーにした状態で数日を経ても変化が少ない。

(2) 味、臭いの改善効果

飼料として用いられるイワシ等は、高度不飽和脂肪酸を多く含む脂質を有しているので、酸化しやすく、酸化した脂質が筋肉中に移行して、養殖魚類の肉質を悪化させる原因となっており、その結果、筋肉に異味、異臭が発生し、商品価値を損なう。本発明の添加剤は、魚油の酸化を相乗的に防止する効果を生じ、養殖魚体内の脂質の過酸化物質濃度も抑える効果が高い。そして、本発明の添加剤の投与により、無添加に比べて明らかに異味、異臭

のないすぐれた肉質が得られる。

(3) メラニン色素沈着防止効果

白身魚と言われる、マダイ、ヒラメ、フグ、ハタ等は、その筋肉中の血管壁に、メラニン色素が沈着することにより黒い糸状の模様が現われ商品価値を損なう。本発明の添加剤を投与することにより、メラニン色素の血管壁沈着を防止し、黒い糸状の模様の発現が少なくなる。

【0015】

【実施例】以下に、実施例を示し、本発明をより具体的に説明する。尚、例中の%は、特に断らないかぎり重量%を意味する。

実施例1. 大豆レシチンとカロチノイドの混合剤を配合した飼料の飼育試験

方法：唐津湾における三菱油化(株)養魚試験場にて飼育したブリ2年魚、平均体重1.7kg±0.3kgを各区20尾で5区設け、平成3年7月1日より9月1日までの2カ月間、各々2.5m角の化繊網簀にて飼育試験を実施した。飼料は三菱油化(株)のブリ用飼料(魚粉と大豆粕等の植物系飼料にビタミン、ミネラル等の他に粘結剤を加えたもの)とイワシミンチ肉を1:1の比率で混合し、試験区別に下記の添加剤を外割で加えて、ペレット状に成形したものを飼料とした。

【0016】試験区：(1)大豆レシチン3%

(2)アスタキサンチン10mg/100g飼料

(3)大豆レシチン3%+アスタキサンチン10mg/100g飼料

(4)大豆レシチン3%+β-カロチン10mg/100g飼料

(5)無添加対照区

(6)カッティングした冷凍イワシの投与区

試験終了時に全魚取り上げ、フィレーに加工して真空パックし、-1℃の冷蔵庫保存したものを3日後に、10名のパネラーにて、血合筋の色、筋肉の味、臭いの官能評価を実施した。

【0017】官能評価法：各試験区のフィレーを刺身で食する大きさにカットしたものを、パネラーには、試験区番号がわからないようにして評価した。評価は、1点：悪い、2点：やや悪い、3点：普通、4点：やや良い、5点：良い、の基準で合計点の高いものを良い肉質とした。また、各区の筋肉中の脂質の過酸化物質濃度をトリフェニルホスフィン試薬を用いるHPLC微量定量法にて定量した。結果を表1に示す。

【0018】

【表1】

5  
表1 ブリ筋肉の官能評価と筋肉脂質の過酸化物質濃度

試験区	血合筋の鮮やかさ	味	臭い	過酸化物質濃度 nmol /mg脂質
1	41	42	40	0.31 (±0.12)
2	35	36	40	0.66 (±0.34)
3	48	48	47	0.18 (±0.10)
4	47	46	48	0.21 (±0.13)
5	31	35	33	1.10 (±0.75)
6	12	22	11	1.82 (±0.51)

【0019】実施例2：イワシ油の酸化に対する抗酸化力

方法：円型口紙（東洋口紙製No. 2、径24cm）に  
下記供試薬剤を含むイワシ油（POV値5meq/kg）4gを口紙全体に拡散させる。これを、気温20～24℃にて、暗室内に吊し、4日後までのPOV値の変化を求めた。POV値は、クロロフォルム200mlでミキサーにかけて、口紙からイワシ油を抽出し、濾過した抽出液をチオ硫酸ナトリウム液にて滴定してPOV値（meq/kg）を求めた。

【0020】供試薬剤：

(1) 大豆レシチン 3.10 (%)

(2) アスタキサンチン 3.10 (mg/100\*30

\* g脂質)

(3) β-カロチン 3.10 (mg/100

g脂質)

(4) 大豆レシチン3%+アスタキサンチン3mg/100g脂質

(5) 大豆レシチン3%+β-カロチン3mg/100g脂質

(6) 菜種レシチン 3%

(7) 鶏卵レシチン 3%

(8) 無添加対照区

結果：表2に示す通りであった。

【0021】

【表2】

7  
表2: イワシ油の酸化に対する抗酸化力 (POV値 meq/kg)  
8

供 試 薬 剤	1	2	3	4日後
①大豆レシチン 3%	11	20	43	52
10%	5	12	16	28
②アスタキサンチン 3mg	10	23	38	52
10%	7	10	16	24
③β-カロチン 3mg	13	33	58	85
10%	6	11	23	50
④大豆レシチン 3% } アスタキサンチン 3mg }	5	5	6	6
⑤大豆レシチン 3% } β-カロチン 3mg }	5	10	12	16
⑥菜種レシチン 3%	10	24	41	55
⑦鶏卵レシチン 3%	8	12	35	40
⑧無添加対照区	61	150	673	1325

【0022】実施例3: マダイに大豆レシチンとアスタキサンチンの混合剤を配合した飼料の投与試験

方法: 1991年6月5日より9月20日まで、唐津湾の三菱油化(株)養魚試験場にて平均体重760g±38gのマダイを1区20尾で2.5m角化繊網簀に収容し、4区設けた。

試験飼料: 三菱油化(株)の大豆レシチン添加前のマダイ用配合飼料(魚粉と大豆粕等の植物系飼料にビタミン、ミネラル等の他に粘結剤を加えたもの)とイワシミンチを1:1の比率としたモイストペレットを試験飼料とした。イサザアミの添加区については、イワシミンチ30%、イサザアミ20%、上記大豆レシチン添加前の配合飼料50%としたモイストペレットにした。

【0023】試験区:

\* (1) 大豆レシチン3%

(2) 大豆レシチン3%+アスタキサンチン10mg/100g飼料

(3) 大豆レシチン3%+イサザアミ20%

(4) 無添加対照区

評価方法(メラニン色素沈着の有無): 試験終了時に、マダイの背鰭基部の筋肉を1cm角で、背骨に向って略均等間隔で3箇所(S-1, S-2, S-3)採材し、各1cm角中の黒変した毛細血管の長さの合計を実体顕微鏡下で測定して3箇所の合計数を1尾分とし、各20尾の合計値を求めて評価した。結果を表3に示す。

【0024】

【表3】

\* 40

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表3 マダイ筋肉毛細血管のメラニン色素沈着の有無 (cm)<sup>10</sup>

試験区	採材部位	S-1	S-2	S-3	合 計
(1) 大豆レシチン	3%	12	10	16	38
(2) 大豆レシチン	3%	3	6	0	9
アスタキサンチン	10mg				
(3) 大豆レシチン	3%	8	5	5	18
イサザアミ	20%				
(4) 無添加対照区		78	64	54	196

【0025】この他に、試験区間にて、血合筋の鮮やかな赤い色について官能評価を実施した結果にても、大豆\*

\*レシチンとアスタキサンチンの混合剤の添加が有効であった。

フロントページの続き

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(54) FEED ADDITIVE FOR CULTURED FISH AND FEED FOR CULTURED FISH

(57)Abstract:

PURPOSE: To obtain a feed additive for cultured fishes and a feed for cultured fishes capable of solving problem in which the quality of cultured fish meat has been formerly inferior to meat of natural fishes and remarkably improving meat quality and the color of body of cultured fishes.

CONSTITUTION: The feed additive for cultured fishes is obtained by blending 100g phospholipid with 0.1-10g carotenoid. The feed for cultured fish contains  $\geq 2$ g phospholipid and  $\geq 3$ mg carotenoid in 100g feed.

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CLAIMS

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[Claim(s)]

[Claim 1]A fish-breeding-feed additive agent blended at a carotenoid [ 0.1g-10g ] rate to the phospholipid 100g.

[Claim 2]An additive agent of claim 1 whose phospholipid is a thing of a soybean, a rapeseed, a hen's egg, and roe origin.

[Claim 3]An additive agent of claim 1 in which carotenoid is chosen from astaxanthin, canthaxanthin, zeaxanthin, a tuna xanthin, RUTEEIN, and beta-carotene.

[Claim 4]Fish breeding feed which contains more than phospholipid 2g and not less than 3 mg of carotenoid in the feed 100g.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to a fish-breeding-feed additive agent. The feed which blended the additive agent is given in this invention.  
Therefore, the texture of farmed fishes is improvable.

[0002]

[Description of the Prior Art]It is just going to be pointed out frequently that the quality of the muscles which are the edible portions of farmed fishes is inferior compared with the muscles of a wild fish. The fleshy difference is the point that the different taste and a nasty smell follow in many cases at that the skillful tone of a color with red dark-flesh muscles, such as a yellowtail, *Pagrus major*, and *Paralichthys olivaceus*, is inferior by a farmed fish next the taste, and a stinking thing point. in the place where a transparent feeling has a white muscle and which should be white, a filar black pattern arises by the melanism of a capillary, and muscles become a dark color, and \*\*\*\* in commodity value -- I may be unacquainted and there is a problem.

[0003]Phospholipid is an important building material and the quantity not more than about 0.1% or it is contained in fish breeding feed, for example, a usual moist pellet and assorted mixed feed. Into feed, it is added as the purposes, such as distribution of an oil, and emulsification, and a calorie source (JP,3-7546,A, JP,48-77,A), and is used also as a nutrient still more nearly required for a juvenile fish term (JP,61-43977,B, the No. 35223 [ 63 to ] gazette).

[0004]On the other hand, although about 0.3 mg of carotenoid coloring matter is contained in fish breeding feed, In order to attach the muscular color of the body surface of Nishiki GOI or *Pagrus major* or a salmon, and masses, natural materials, such as the shrimp, the crab, the

seaweed, Spirulina, the marigold and alfalfa containing carotenoid or carotenoid, and yeast, are blended with feed, and are prescribed for the patient. ("Carotenoid of aquatic animal" Koseisha-Koseikaku Showa 63 issue, JP,63-61907,B, etc.)

However, these methods are not used in order to improve the above-mentioned texture of farmed fishes, and it cannot be said that the improvement effect is still enough.

[0005]

[Problem(s) to be Solved by the Invention]The texture of these conventional farmed fishes tends to solve the problem that it is inferior compared with the muscles of a wild fish, and this invention tends to provide the fish-breeding-feed additive agent which can improve substantially the texture and the color of the body of farmed fishes.

[0006]

[Means for Solving the Problem]As a result of repeating research wholeheartedly, by medicating fishes with feed which blended with phospholipid an additive agent which mixes carotenoid, this invention persons find out that it is effective in improving a fault of the above-mentioned farmed fish substantially, and came to complete this invention. That is, this invention provides a fish-breeding-feed additive agent which improves texture of a farmed fish which blends the carotenoid 0.1g-10g to the phospholipid 100g, and fish breeding feed which contains more than phospholipid 2g and not less than 3 mg of carotenoid in the fish breeding feed 100g.

[0007]Phospholipid is a building material contained in \*\*, and a vegetable cell and a seed, and comprises phosphatidylcholine, phospholipid ethanolamine, phospholipid serine, etc. As phospholipid used for this invention, a soybean, lecithin produced from an oil expression process of a rapeseed, lecithin obtained from an egg yolk of a hen's egg, and lecithin of roe origin are mentioned. Generally, a soybean lecithin is mainly used. High grade lecithin by which lecithin obtained at an oil expression process was usually obtained as a fluid with the viscosity of about 40% of lecithin 60% soybean oil, and deoiling refining was carried out by an organic solvent is cream-colored powder.

[0008]In this invention, although a powdered thing can be used as it is, what was diluted with vegetable oil and fat or animal fat and oil can also be used. As vegetable oil and fat used for dilution, soybean oil, corn oil, oleum rapae, olive oil, the Beni \*\*\*\*, cottonseed cake oil, etc. are mentioned, and lard, beef fat, fish oil, etc. are mentioned as animal fat and oil. A rate of dilution by fats and oils from the purpose added in feed is usually 10 or less times.

[0009]Carotenoid is an ingredient which constitutes a living body as carotenoid coloring matter which reveals flesh color of fishes, or a provitamin. As carotenoid used for this invention, astaxanthin, canthaxanthin, zeaxanthin, a tuna xanthin, RUTEEIN, and beta-carotene are mentioned. Such carotenoid has what is obtained by chemosynthesis, and a thing extracted from a natural material, and the any may be used for it. A carotenoid complex etc. which

contain astaxanthin 80% as a commercial item as natural krill oil besides being astaxanthin pharmaceutical preparation, a beta-carotene crystal, etc. can be used.

[0010]carotenoid, such as astaxanthin, canthaxanthin, and RUTEEIN, -- several -- about mg% -- an included shrimp (an opossum shrimp.) crabs, such as a krill, and carotenoid -- several 10 -- about mg% -- seaweed, Spirulina, a marigold, alfalfa, etc. which are included, and carotenoid -- about 50-100mg% -- natural materials, such as included red yeast, -- the shape of minced meat, or beating -- or it can also grind and use. Although a blending ratio of phospholipid and carotenoid determines the kind and quantity by farmed fishes, ranges of it of 0.1g - 10 g of carotenoid are usually 0.1g-1.0g preferably to the phospholipid 100g.

[0011]A fish-breeding-feed additive agent of this invention is blended and used for feed with which farmed fishes are medicated. Many \*\*\*\*, such as a sardine, a mackerel, a horse mackerel, a Pacific saury, and a sand lance, are used, as it is, feed with which farmed fishes are medicated mainly makes it the shape of minced meat, after freezing or, and a case where binders, such as CMC and guar gum, are used together and blended, and a thing which processed these many \*\*\*\* into fish meal may be blended and medicated with it.

[0012]Although it is 0.1g/100g feed -10g/100g feed, quantity added in feed is added so that it may become the amounts 2g-10g of phospholipid/100g feed, and the amount of carotenoid of 3 mg - 100 mg/100g feed preferably. Although it changes with concentration and fish stocks, since an effect is revealed with thickening, a period with which feed is added and medicated is \*\*\*\* about two weeks or more.

[0013]

[Function]Although it is a grade in which the color accumulated by shift of the coloring matter in the single use of carotenoid appears, While promoting stabilization of the myoglobin pigment in the dark-flesh muscle which is not carotenoid and emitting skillful tone according to concomitant use with phospholipid the effect's not only increasing, but, it became clear that it continued. An improvement is found also in the taste and a stinking thing point, and the melanism of a capillary is also prevented.

[0014]

[Effect of the Invention]

(1) There are a white muscle and a dark-flesh muscle in the muscles of the red maintenance effect fishes skillful in a dark-flesh muscle. Although the coloring matter of this red dark-flesh muscle is a color according to a myoglobin pigment unlike carotenoid, the dark-flesh muscle of farmed fishes has dramatically prompt discoloration. Even if it passes through several days in the state where the skillful red dark-flesh muscle arose to the muscles of the farmed fishes which continued administration of the feed containing the additive agent of this invention, and it was made the fillet, there is little change.

(2) Since sardines used as the taste and stinking thing improvement effect feed have the lipid

containing many higher unsaturated fatty acids, it is easy to oxidize, the lipid which oxidized shifts into muscles, it has become the cause of worsening the texture of farmed fishes, as a result, the different taste and a nasty smell occur to muscles, and they spoil commodity value. The additive agent of this invention has the high effect of producing the effect of preventing oxidation of fish oil synergistically, and also pressing down the peroxide concentration of the lipid of the farmed fish inside of the body. And the outstanding texture which does not have a different taste and a nasty smell clearly compared with additive-free is acquired by administration of the additive agent of this invention.

(3) A filar black pattern appears in the blood vessel wall in the muscles, and *Pagrus major*, *Paralichthys olivaceus*, a globefish, Hata, etc. which are called melanism preventive effect white-fleshed fish spoil commodity value to it, when a melanin deposits. By prescribing the additive agent of this invention for the patient, blood vessel wall deposition of a melanin is prevented and the manifestation of a filar black pattern decreases.

[0015]

[Example]Below an example is shown and this invention is more concretely explained to it. Especially % in an example means weight %, unless it refuses.

A breeding test method of the feed which blended the admixture of an example 1. soybean lecithin and carotenoid : The yellowtail two-year fish bred in the Mitsubishi Petrochemical Co., Ltd. fish breeding examination site in the Karatsu bay, Average weight 1.7kg\*\*0.3kg was provided the 5th division in each 20 divisions, and the breeding examination was respectively carried out in man-made fiber \*\*\*\* of a 2.5-m angle for [ by September 1 ] two months from July 1, Heisei 3. feed mixes the feed for yellowtails (what added the binder else [ , such as a vitamin and a mineral, ] to vegetable system feed, such as fish meal and soybean cake) and sardine minced meat of Mitsubishi Petrochemical Co., Ltd. by the ratio of 1:1 -- the additive agent of the following [ exception / experimental plot ] -- an outside rate -- in addition, what was fabricated to the pellet type was used as feed.

[0016]Experimental plot :. (1) 3% of a soybean lecithin. (2) Astaxanthin 10mg/100g feed. (3) Process and carry out a vacuum packing to all the fish picking raisings and a fillet at the time of the administration division test termination of a frozen sardine which carried out 10 mg of 3% of 3% of soybean lecithin + astaxanthin 10mg/100g feed (4) soybean lecithin + beta-carotene/100g feed (5) additive-free control plot (6) cutting, -The color of a dark-flesh muscle, the muscular taste, and stinking thing organic-functions evaluation were carried out for the 1 \*\* thing which carried out refrigerator preservation by ten persons' panelist three days afterward.

[0017]Sensory evaluation method: As a panelist did not find an experimental plot number for what cut the fillet of each experimental plot into the size eaten as sliced raw fish, it was evaluated. evaluation -- one point: -- bad two point: -- a little bad three point: -- usually -- four point: -- a little good five point: -- good [ in the high thing of a totaling point ] on the standard of

good \*\* -- it was presupposed that it is fleshy. The peroxide concentration of the lipid in the muscles of each division was quantified in the HPLC microestimation using a triphenyl phosphine reagent. A result is shown in Table 1.

[0018]

[Table 1]

表1 ブリ筋肉の官能評価と筋肉脂質の過酸化物濃度

試験区	血合筋の鮮やかさ	味	臭い	過酸化物濃度 nmol /mg脂質
1	41	42	40	0.31 (±0.12)
2	35	36	40	0.66 (±0.34)
3	48	48	47	0.18 (±0.10)
4	47	46	48	0.21 (±0.13)
5	31	35	33	1.10 (±0.75)
6	12	22	11	1.82 (±0.51)

[0019]example 2: -- antioxidative activity method: to oxidation of sardine oil -- the whole filter paper is made to diffuse 4 g of sardine oil (POV value 5 meq/kg) which contains the following sample offering drugs in circle type filter paper (No.2 made of Oriental filter paper, diameter of 24 cm) This was hung in the dark room in 20-24 \*\* of atmospheric temperature, and it asked for the POV value change to the backward one on the 4th. The POV value was applied to the mixer by 200 ml of chloroform, extracted sardine oil from filter paper, titrated the filtered extract with the sodium thiosulfate solution, and calculated the POV value (meq/kg).

[0020]Sample offering Drugs:(1) soybean lecithin 3 and 10. (%) (2) astaxanthins 3 and 10. (mg/100g lipid) (3) beta-carotene . 3 mg of 3% of 3 and 3% of 10 ((mg/100g lipid) 4) soybean-lecithin + astaxanthin 3mg/100g lipid (5) soybean lecithin + beta-carotene/100g lipid (6) rapeseed lecithin 3% hen's-egg [ (7) ] lecithin (8) additive-free [ 3% ] control-plot result: It was as being shown in Table 2.

[0021]

[Table 2]

表 2 : イワシ油の酸化に対する抗酸化力 (POV値 meq/kg)

供 試 薬 剤		1	2	3	4 日後
①大豆レシチン	3 %	1 1	2 0	4 3	5 2
	10 "	5	1 2	1 6	2 8
②アスタキサンチン	3 mg	1 0	2 3	3 8	5 2
	10 "	7	1 0	1 6	2 4
③β-カロチン	3 mg	1 3	3 3	5 8	8 5
	10 "	6	1 1	2 3	5 0
④大豆レシチン	3 %	5	5	6	6
アスタキサンチン	3 mg				
⑤大豆レシチン	3 %	5	1 0	1 2	1 6
β-カロチン	3 mg				
⑥菜種レシチン	3 %	1 0	2 4	4 1	5 5
⑦鶏卵レシチン	3 %	8	1 2	3 5	4 0
⑧無添加対照区		6 1	1 5 0	6 7 3	1 3 2 5

[0022]example 3: -- administration test-method [ of the feed which blended the admixture of a soybean lecithin and astaxanthin with Pagrus major ]: -- from June 5, 1991, by 20 per division, average weight 760g\*\*38g Pagrus major was accommodated in 2.5-m angle man-made fiber \*\*\*\*, and was provided the 4th division in the Mitsubishi Petrochemical Co., Ltd. fish breeding examination site of the Karatsu bay till September 20.

Examination feed: The moist pellet which made the ratio of 1:1 the assorted mixed feed for Pagrus major (what added the binder else [ , such as a vitamin and a mineral, ] to vegetable system feed, such as fish meal and soybean cake) and sardine minced meat before soybean lecithin addition of Mitsubishi Petrochemical Co., Ltd. was used as examination feed. About the additive area of the opossum shrimp, it was made the moist pellet used as 50% of the assorted mixed feed before the above-mentioned soybean lecithin addition opossum shrimp 20% sardine minced meat 30%.

[0023]experimental plot: -- (1) soybean-lecithin 3%(2) soybean-lecithin 3%+ astaxanthin 10mg/100g feed (3) soybean-lecithin 3%+ opossum shrimp 20%(4) additive-free control plot valuation method (existence of melanism): -- at the time of test termination. Three-place (S-1, S-2, S-3) wood conversion of the muscles of the dorsal fin base of Pagrus major was carried

out at the approximately equivalent interval toward the backbone with a 1-cm square, the sum total of the length of the capillary in a 1-cm each angle discolored in black was measured under the stereoscopic microscope, the three total numbers were considered as one fish, and it evaluated in quest of the total value of 20 fish each. A result is shown in Table 3.

[0024]

[Table 3]

表3 マダイ筋肉毛細血管のメラニン色素沈着の有無 (c m)

試験区	採材部位	S - 1	S - 2	S - 3	合 計
(1) 大豆レシチン	3 %	1 2	1 0	1 6	3 8
(2) 大豆レシチン	3 %	3	6	0	9
アスタキサンチン	10mg				
(3) 大豆レシチン	3 %	8	5	5	1 8
イサザアミ	20%				
(4) 無添加対照区		7 8	6 4	5 4	1 9 6

[0025]In addition, addition of the admixture of a soybean lecithin and astaxanthin was effective also at the result of having carried out organic-functions evaluation about the red color skillful in a dark-flesh muscle in the test section.

[Translation done.]

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TECHNICAL FIELD

---

[Industrial Application]This invention relates to a fish-breeding-feed additive agent. The feed which blended the additive agent is given in this invention.  
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PRIOR ART

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[Description of the Prior Art]It is just going to be pointed out frequently that the quality of the muscles which are the edible portions of farmed fishes is inferior compared with the muscles of a wild fish. The fleshy difference is the point that the different taste and a nasty smell follow in many cases at that the skillful tone of a color with red dark-flesh muscles, such as a yellowtail, *Pagrus major*, and *Paralichthys olivaceus*, is inferior by a farmed fish next the taste, and a stinking thing point. in the place where a transparent feeling has a white muscle and which should be white, a filar black pattern arises by the melanism of a capillary, and muscles become a dark color, and \*\*\*\* in commodity value -- I may be unacquainted and there is a problem.

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However, these methods are not used in order to improve the above-mentioned texture of farmed fishes, and it cannot be said that the improvement effect is still enough.

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## EFFECT OF THE INVENTION

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### [Effect of the Invention]

(1) There are a white muscle and a dark-flesh muscle in the muscles of the red maintenance effect fishes skillful in a dark-flesh muscle. Although the coloring matter of this red dark-flesh muscle is a color according to a myoglobin pigment unlike carotenoid, the dark-flesh muscle of farmed fishes has dramatically prompt discoloration. Even if it passes through several days in the state where the skillful red dark-flesh muscle arose to the muscles of the farmed fishes which continued administration of the feed containing the additive agent of this invention, and it was made the fillet, there is little change.

(2) Since sardines used as the taste and stinking thing improvement effect feed have the lipid containing many higher unsaturated fatty acids, it is easy to oxidize, the lipid which oxidized shifts into muscles, it has become the cause of worsening the texture of farmed fishes, as a result, the different taste and a nasty smell occur to muscles, and they spoil commodity value. The additive agent of this invention has the high effect of producing the effect of preventing oxidation of fish oil synergistically, and also pressing down the peroxide concentration of the lipid of the farmed fish inside of the body. And the outstanding texture which does not have a different taste and a nasty smell clearly compared with additive-free is acquired by administration of the additive agent of this invention.

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OPERATION

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**EXAMPLE**


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phosphine reagent. A result is shown in Table 1.

[0018]

[Table 1]

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6	12	22	11	1.82 (±0.51)

[0019]example 2: -- antioxidative activity method: to oxidation of sardine oil -- the whole filter paper is made to diffuse 4 g of sardine oil (POV value 5 meq/kg) which contains the following sample offering drugs in circle type filter paper (No.2 made of Oriental filter paper, diameter of 24 cm) This was hung in the dark room in 20-24 °C of atmospheric temperature, and it asked for the POV value change to the backward one on the 4th. The POV value was applied to the mixer by 200 ml of chloroform, extracted sardine oil from filter paper, titrated the filtered extract with the sodium thiosulfate solution, and calculated the POV value (meq/kg).

[0020]Sample offering Drugs:(1) soybean lecithin 3 and 10. (%) (2) astaxanthins 3 and 10. (mg/100g lipid) (3) beta-carotene . 3 mg of 3% of 3 and 3% of 10 ((mg/100g lipid) 4) soybean-lecithin + astaxanthin 3mg/100g lipid (5) soybean lecithin + beta-carotene/100g lipid (6) rapeseed lecithin 3% hen's-egg [ (7) ] lecithin (8) additive-free [ 3% ] control-plot result: It was as being shown in Table 2.

[0021]

[Table 2]

表 2 : イワシ油の酸化に対する抗酸化力 (POV値 meq/kg)

供 試 薬 剤		1	2	3	4 日後
①大豆レシチン	3 %	1 1	2 0	4 3	5 2
	10 "	5	1 2	1 6	2 8
②アスタキサンチン	3 mg	1 0	2 3	3 8	5 2
	10 "	7	1 0	1 6	2 4
③β-カロチン	3 mg	1 3	3 3	5 8	8 5
	10 "	6	1 1	2 3	5 0
④大豆レシチン	3 %	5	5	6	6
アスタキサンチン	3 mg				
⑤大豆レシチン	3 %	5	1 0	1 2	1 6
β-カロチン	3 mg				
⑥菜種レシチン	3 %	1 0	2 4	4 1	5 5
⑦鶏卵レシチン	3 %	8	1 2	3 5	4 0
⑧無添加対照区		6 1	1 5 0	6 7 3	1 3 2 5

[0022]example 3: -- administration test-method [ of the feed which blended the admixture of a soybean lecithin and astaxanthin with Pagrus major ]: -- from June 5, 1991, by 20 per division, average weight 760g\*\*38g Pagrus major was accommodated in 2.5-m angle man-made fiber \*\*\*\*, and was provided the 4th division in the Mitsubishi Petrochemical Co., Ltd. fish breeding examination site of the Karatsu bay till September 20.

Examination feed: The moist pellet which made the ratio of 1:1 the assorted mixed feed for Pagrus major (what added the binder else [, such as a vitamin and a mineral, ] to vegetable system feed, such as fish meal and soybean cake) and sardine minced meat before soybean lecithin addition of Mitsubishi Petrochemical Co., Ltd. was used as examination feed. About the additive area of the opossum shrimp, it was made the moist pellet used as 50% of the assorted mixed feed before the above-mentioned soybean lecithin addition opossum shrimp 20% sardine minced meat 30%.

[0023]experimental plot: -- (1) soybean-lecithin 3%(2) soybean-lecithin 3%+ astaxanthin 10mg/100g feed (3) soybean-lecithin 3%+ opossum shrimp 20%(4) additive-free control plot valuation method (existence of melanism): -- at the time of test termination. Three-place (S-1, S-2, S-3) wood conversion of the muscles of the dorsal fin base of Pagrus major was carried

out at the approximately equivalent interval toward the backbone with a 1-cm square, the sum total of the length of the capillary in a 1-cm each angle discolored in black was measured under the stereoscopic microscope, the three total numbers were considered as one fish, and it evaluated in quest of the total value of 20 fish each. A result is shown in Table 3.

[0024]

[Table 3]

表3 マダイ筋肉毛細血管のメラニン色素沈着の有無 (c m)

試験区	採材部位	S - 1	S - 2	S - 3	合 計
(1) 大豆レシチン	3 %	1 2	1 0	1 6	3 8
(2) 大豆レシチン	3 %	3	6	0	9
アスタキサンチン	10mg				
(3) 大豆レシチン	3 %	8	5	5	1 8
イサザアミ	20%				
(4) 無添加対照区		7 8	6 4	5 4	1 9 6

[0025]In addition, addition of the admixture of a soybean lecithin and astaxanthin was effective also at the result of having carried out organic-functions evaluation about the red color skillful in a dark-flesh muscle in the test section.

[Translation done.]